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INTRODUCTORY.

The change in the editorial control of this Journal, occasioned by the death of its late editor, Major G. Warren Dresser, necessitates some few remarks from the writer, who will now have charge of the paper in that department. These remarks will be as to the course of the paper, and also as to the line of policy to be carried out in the future, to the end that the JOURNAL may be made a reliable and valuable vehicle of information to all those who are or may become interesed in the manufacture and distribution of illuminating gas.

To make the JOURNAL a desirable source of information to its patrons, and the fraternity generally, all items of interest in any manner connected with the process of manufacture and distribution will be carefully collected from any and all sources where information on these subjects can be obtained; and any assistance rendered in the collection of such matter, by those in a position to furnish the same, will be gladly received. Help of this nature will enable us to keep a complete record of everything connected with the business in which all our readers are equally interested—viz., the manufacture of illuminating gas, and the best and most economical methods of producing the same.

It is very interesting and instructive to know what is being done and what is going on around us; what, and where, improvements are to be made; what new additions are contemplated in works already in operation, with a view to further develop economy in the process of manufacture. Changes are constantly occurring, the prime object of such changes being to reduce cost of production to the lowest possible figure; and the experience of those engaged in this laudable effort, when freely and fully given to others occupying the same business field, cannot fail to be of great material aid and assistance.

The JOURNAL, being almost exclusively confined to matters appertaining to the manufacture and proper distribution of gas, necessarily limits the field to be covered; and this may cause, in the treating of many topics, a seeming repetition of what has already appeared in its columns, and revive discussion on subjects which, it may have been thought, were thoroughly considered and disposed of. Be this as it may, however, the improvements constantly going on around us in all matters relating to the manufacture of illuminating gas are so rapid in development that renewed discussion on the same subjects is sure to be of material interest to (and certain to benefit, by bringing out valuable ideas) all who are engaged in this great industry.

The principal desire on the part of the JOURNAL will be to subserve the best interests of the gas manufacturing fraternity, and also to protect, to the best of its ability, the necessarily large capital required in the successful carrying out of the operations of manufacture. In order that this may be done, everything new and important will be as carefully considered and as thoroughly discussed in the columns of the paper as time and space will admit of—treating every subject fairly and impartially, believing that merit alone should be the test of recommendation, and upon that test must such subjects either stand or fall.

Although the manufacture of illuminating gas, in a measure, would seem to be quite an old institution, coming as it did about the beginning of this century, the many new uses recently developed for its employment in other spheres than that of lighting but go to show that it is still only in its infancy; and it will only be necessary to properly call the attention of the public to

these new uses in which it may be successfully employed, to still more largely increase its sale.

The field for the introduction and use of gas for cooking, heating, power, and manufacturing purposes would seem to be unlimited. Careful and intelligent efforts on the part of those now engaged in the business have already opened up this promising district, and renewed zeal and increased persistence in this same direction cannot fail to be eventually crowned with even greater success in the future.

The prospects for the gas manufacturing fraternity were, we think, never brighter than at present; and although, in the second advent of electricity as a competitor in the field of artificial illumination, it was claimed—nay, not only claimed, but asserted with all positiveness—that gas had outlived its usefulness, and that gas makers, if not typical Othellos, would find their occupation "gone where the woodbine twineth." How have these prognostications been borne out? The test of time has shown their shallowness; and to-day gas lighting is more strongly intrenched than ever.

The employment of electricity for lighting purposes has given a great impetus to gas consumption. It has created a desire on the part of the people for more light, and it has impelled the gas maker to use his best endeavor to intelligently supply the demand thus created. To meet this desire for a better and improved light from gas, the manufacturers of burners have not been idle; they have gone steadily ahead in the improvement of their wares, and the advances which have been made in this direction are really remarkable. Take the improved burner of to-day and compare it with the best sample of a few years back, and what do we find? The improvement is such that double, or even treble, the amount of light is obtained now than was formerly obtained with an equal consumption of gas. Of the many improved burners for lighting powers, consuming large quantities of gas and giving correspondingly good results, we think the Siemens equal, if not superior, to any yet brought to our notice; and wherever these burners have been set up, have proven very satisfactorily that gas, as a means of artificial lighting, is well able to hold its own where both lighting and economy are at all to be taken into consideration.

The Siemens burners lately placed in the office of the Manhattan Gas Light Company, Fifteenth street and Irving place, in this city, would seem to be all that could be desired in the matters of lighting and ventilation. A visit to the Manhattan Company's office, by parties having large spaces to illuminate, would certainly prove interesting and instructive. Such a visit would be amply repaid in the knowledge secured as to the value of this class of burners for the lighting of large rooms and halls where a perfect and beautiful light is required, and the ease and economy with which the results are obtained.

While very great improvements have been made in large burners, the ordinary consumer's burner has neither been neglected nor forgotten; and we are confident that the 3 to 10 feet burners of to-day give better results than any that were ever before manufactured.

An important and essential duty devolving upon all those engaged in the manufacture and sale of illuminating gas is to do all in their power to educate their consumers; teach your consumers how to use the gas that they pay for in the most economical and perfect manner. By doing this, cordial relations will be established and maintained between manufacturer and consumer. It can be readily pointed out that there are many places, in houses, shops, and factories, where small burners will give all the light necessary, and quite as simple a matter to show that any unnecessary light is simply extravagant and wasteful. Then, again, on the other hand, there are other situations in which small burners are not economical—where a greater flood of illumination is required; and such greater volume of light can be obtained much more cheaply by substituting the larger burners for the smaller ones, on account of the better combustion of the gas and the increased light proceeding from the more perfect combustion. Where a large volume of light is required, burners consuming from 5 to 6 cubic feet per hour will give better lighting results than a greater number of smaller burners requiring the same quantity of gas to supply them. See to it that your consumers are supplied with burners of the best quality—those that will give the greatest quantity of light per cubic foot of gas consumed; and wherever this is done it is certain to result in greater satisfaction to the consumer, and also inure to the best interests of the manufacturer.

As said before, the introduction of gas for the purpose of cooking, heating, etc., has opened up a vast field, the true proportions of which can only be measured by the amount of energy expended in its proper development; and while much has already been done in this direction, we think it is as nothing when compared with what is possible of accomplishment by a thorough exposition to the consumer of the true merits of gas for cooking and heating. The economy and cleanliness of gas stoves can be readily demonstrated, and should be sufficient to bring them into use wherever cooking is done. The great variety of gas stoves and heaters now offered to the public is very complete. Beginning with the small furnace for boiling or frying, and continuing up to the complete kitchen range, which may be used for roasting, broiling, baking, and all other descriptions of cooking in the culinary department of a household, it needs but simple demonstration to show that the work can be performed by them in a manner much superior to that heretofore done by the ordinary house range. These advantages, properly brought to the attention of the public, will speedily bring them into use, and of necessity largely increase the gas maker's send-out.

In conclusion, we will simply state that our best efforts will be put forth to make this paper the great desideratum to help, aid, and assist our brethren engaged in the manufacture of illuminating gas, by bringing to their notice everything new in the way of improved apparatus for gas manufacturing, and by calling their attention to all matters presumed to be of interest to them in their business. We shall try to do our duty to all, speaking fairly and plainly on any subjects brought to our notice, seeking only to do right by all with whom we may be brought into contact. We believe in the right; and, firmly holding to that position, shall advocate everything which we think and believe will be for the best interests of the large and extensive business represented by this JOURNAL.

Proceedings of the Society of Gas Lighting in Relation to the Death of Major George Warren Dresser.

At a meeting of the Society of Gas Lighting, held at New Haven, Conn., on June 21, the following preamble and resolutions were unanimously adopted:

WHEREAS, The members of this Society have learned with profound regret of the death of their late fellow-member and secretary, Major George Warren Dresser,

Resolved, That this Society has lost one of its originators, esteemed as a most valuable, intelligent, energetic, and able member, one whose amiability, modesty, consideration for others, and courteous bearing endeared him to all his fellow-members; whose independent views, and high honor, made him respected by all who knew him; and that his death severs ties that were to the members of this Society peculiarly close and binding.

Resolved, That we tender to the relatives of the deceased our warmest sympathy in their bereavement.

Resolved, That these resolutions be entered upon the records of the Society, that a copy be transmitted to the relatives of the deceased, and also that this action of the Society be published in the AMERICAN GAS LIGHT JOURNAL.

FRED. S. BENSON, *Secretary pro tem.*

The Management of Small Gas Works.

The continuation of the article on the "Management of Small Gas Works," by C. J. R. Humphreys, is unavoidably postponed. The next portion of the subject will appear in the issue of July 16.

Determination of the Temperature of Furnaces.

The method adopted by the Paris Gas Company for ascertaining the temperature of retorts and settings is described at great length by M. Leclerc, from whose "Note," read at the recent congress of the Société Technique, we extract the following particulars: The appliances consist of a covered wooden pail holding 10 litres. The lid of this pail is pierced with a hole, and fitted with a thermometer with scale projecting above the surface. A cube of iron weighing 2 kilogrammes, and a long iron pricker for moving the same, complete the list of articles used. For taking temperatures of flues, retorts, etc., the block of iron is placed in the indicated position, and left there until it becomes of the same degree of heat. The block is made with a hole for the insertion of the pricker; and by this means, when the temperature of a chimney-shaft is required, the iron is simply held at the desired height while the rod passes through the hole in the brickwork. While this is going on the pail is placed on the level ground—a condition facilitated by the fact that at the 10-litre water-line there are three equidistant spill holes in its sides. Water is poured in until it overflows at these points, which are then closed. The cover fitted with the thermometer is then placed in position, and briskly spun round three or four times. In this way the initial temperature of the water may be read off. The block of iron, which should have been at least 25 minutes in the heat, is then quickly drawn out and dropped into the water in the pail—an operation which should only require two or three seconds to execute. The cover is then turned anew, and the highest temperature of the water is read off. This concludes the experiment. Tables are compiled for use with the appliance, and these give the required temperature of the iron corresponding to the observed elevation of the temperature of the water. The thermometer employed registers to the fourth of a degree centigrade. The system is found sufficiently exact for all practicable purposes, and is so simple, and requires so little pains to carry out after the appliances have been prepared, that it deserves more extended use. It is evident, moreover, that although the method of measurement is liable to errors, these are likely to be fairly uniform with all the tests; and therefore the average result will be tolerably reliable.—*Journal of Gas Lighting.*

[Official Report.—Continued from page 274, Vol. XXXVIII.]

Sixth Annual Meeting of the Western Gas Association.

Held at the Burnet House, Cincinnati, Ohio, May 9, 10, and 11, 1883.

First Day—Afternoon Session—May 9.

Continuation of the Discussion on Mr. Burns' Paper on "The Lowe Water Gas Works at Pullman, Ill."

Mr. Page—Commending Mr. Coverdale's warning to coal gas men—that they stand in a ticklish position concerning water gas—I would add this amendment to his reasons: That if any of you should leave the cock open, and water gas comes through the pipe into your room at night, you would lie in a ticklish position before morning.

Mr. Burns—And I will add that if you left the cock open and breathed the coal gas all night, you would be very dead in the morning.

Mr. Lansden—I wish to ask Mr. Burns, if he has such confidence in the component parts of water gas, as compared with coal gas, that he can assert that a person would be no more injured by breathing water gas than he would by breathing coal gas for the same length of time? What is his opinion as to that?

Mr. Burns—So far as my observation is concerned, it is this: Water gas makes a person sick quicker, but recovery comes more speedily.

Mr. King—It seems to me that the most serious point to take into consideration, with regard to this water gas question, is the fact that the prices of materials are continually varying. The light hydrocarbon oils are speculative in value, and are governed, as to prices, by the supply in the oil region. As to hard coal, it has varied in price with us as much as 50 per cent. in two years. How such changes might affect us should, I think, be taken seriously into consideration before making any radical change in our manufacture.

The President—Mr. Smedberg has of late been identified with water gas. We would like to hear from him.

Mr. J. R. Smedberg (Lancaster, Pa.)—My story is a very short one. In 1860 I was engineer of the Savannah gas works. There was an unfortunate affair called the "blockade" which prevented us from getting coal, and made it necessary to change the works to wood gas, with light wood for material. We manufactured wood gas during the whole four years of our war. During that period I was knocked down several times by this gas. We had some other cases of sickness from it; but we all got over it; at any rate, I am not blood poisoned yet. Wood gas carries from 50 to 60 per cent. of carbonic oxide. This is according to the latest tests contained in the only monograph on wood gas yet published. Since the war I have built seven or eight wood gas works, and have been repeatedly prostrated by the gas, but have always picked myself up. So much for this carbonic oxide bugbear. It is all stuff; there is nothing in it. I became, last September, the manager of the Lancaster Gas Light and Fuel Company. Since then we have been making an average of 150,000 feet a day. The record of that company was this: There was a coal gas company in possession of the ground, and this Lowe gas process was taken up as a weapon by men who were dissatisfied with tar at their burners, leaky pipes, and too high a price for the gas. The water gas company laid 17 miles of pipe. From one of the high-level outlets they flooded that whole 17 miles of mains full of water. They made all the pipes good under that pressure. Since that time they have had 2,000 services to transfer—all under pressure—after the surrender or consolidation was effected. This transfer of services happened before I went there; but there were only a few cases of men being capsized in the trenches. Those men are now as well, and as thoroughly alive, as any of us. During the process of transferring the services there was, at one juncture, an opportunity of testing exactly, through the same mains, the respective leakage of coal gas and water gas. The difference agreed exactly with the specific gravity of the gas. It bore out the established formula that the ratio is in a known proportion between the two densities, which was, of course, in favor of the water gas. We are now lighting no public lamps, so that I know just what our leakage is. We know what the coal gas leakage was; it was 37 per cent. Of course, the mains were all rotten and worn out, and they had been badly laid in the first place. I was mistaken in saying that I could tell exactly what our present leakage is. We cannot, and for this reason: We have our city split into three districts, and we take them alternately every quarter. I know the leakage to be less than 5 per cent. But I have not been through the full year yet. I have here an official statement of what it costs us to send out 200,000 feet of gas per night. The statement was made by me to my directors. I have the daily records for 90 days, which I took in pencil every day, and clipped into a cover. I have brought them with me, thinking that if some super-serviceable friend *should* bring me to the front I would be prepared with the figures. I do not propose to publish them, nor to put them in a shape for publishing; but if any of you gentlemen wish to see them you are welcome. I will tell you what we pay for labor, what we pay for coal, and what we pay for naphtha. I will tell you what our candle power is. I do not wish you to think that I am a partisan of the Lowe process, for I am not; I cannot forget my old love so quickly as that; but I am mindful of the fact that there are 110 companies out of the 800 companies in the United States which are not coal gas companies; and I am willing impartially to compare one system with the other, and to frankly acknowledge whatever of value I find in either. If any of you care to take the figures which I have, and to cipher out the results for yourselves, they are very much at your service.

Mr. Lansden—Do I understand Mr. Smedberg to say that this matter of carbonic oxide is all a bugbear as compared with coal gas?

Mr. Smedberg—Certainly; the comparison is as between strychnine and arsenic.

Mr. Lansden—Therefore, if a man happens to blow his gas out, and remains for two hours in his room, inhaling gas, he would be killed as quickly and surely by coal gas as he would by water gas containing this large percentage of carbonic oxide?

Mr. Smedberg—I cannot cipher a man's death down to five minutes.

Mr. Lansden—Will coal gas kill a man as quickly as water gas?

Mr. Smedberg—I do not know; I have not gone into the question as finely as that. I can only say that I have been knocked down many times with wood gas, containing 50 or 60 per cent. of carbonic oxide.

Mr. Coverdale—I saw you when you were making wood gas. I was sent down by Gen. Sherman to take charge of those gas works.

Mr. Smedberg—I had forgotten that *Colonel* Coverdale was one of the boys who came down there.

Mr. Thomas Butterworth (Rockford, Ill.)—Do you, Mr. Smedberg, know of any gas works, making gas by the Lowe or water gas process, that is paying dividends, or that has paid dividends right along, and paid interest upon the cost of the patent right and the works?

Mr. Smedberg—I know of none excepting my own. I do not know what others are doing, and do not care. I only wish to say to Mr. Butterworth, and to the other gentlemen, that my figures are at their service.

Mr. Burns—If Mr. Butterworth wishes to see works which are paying dividends, and using the Lowe process, he can be gratified if he will stop at Pullman. Our little works have made $18,000 in two years.

Mr. Butterworth—Is it not the fact that your $18,000 dividend was made in this way—that when you had sold for a certain price to the consumers, and had charged the city for street lamps at a certain price, the rest of the gas which you had made was charged over to the Pullman Company at a certain price, so as to enable you to balance your books in that way?

Mr. Burns—Every institution belonging to the Pullman Palace Car Company is numbered among our consumers; but our works are carried on as separate and distinct from the other interests as are yours in Rockford. Every consumer we have pays us for the gas consumed. Perhaps no money actually changes hands, but our credits are given and our debits are taken. We are credited with every bit of gas that we give to the Pullman Company in every one of their shops. If we get anything from the shops we are charged for it, and an additional percentage of profit added. The books in our works are kept just as separate and distinct from those of every other institution as yours in Rockford are kept separate and distinct from any other manufacturing company in your town.

The President—We have a member present who can, no doubt, throw considerable light upon the water gas business, as he is connected with the West Side (Chicago) Company, and engaged in the manufacture of gas under the Springer process. We would like Mr. Henry Pratt to give us some information with regard to water gas.

Mr. H. Pratt (Chicago, Ill.)—I did not bring any data with me, and came here on other business. I do not know that I can add anything new to what has already been said with regard to the water and coal gas processes.

The President—I would like to ask Mr. Pratt if he would have any objection to stating before the convention the difference as between the Springer and the Lowe process.

Mr. Pratt—I believe that the only difference is in the construction of the machinery. The processes are practically the same. I do not known of any difference in the principles. We use either coke or anthracite coal, and we sometimes mix the two together.

Mr. L. K. Scofield (Fort Scott, Kan.)—At St. Louis I had the pleasure of an interview with Mr. Lowe himself, and he took me through his works. He impressed me quite strongly as to the Lowe process of manufacture. I saw there 16,000 feet of gas put into the holder in less than three minutes. They are repairing, and have their machinery nearly ready for the use of bituminous coal; they are now using anthracite. He told me that he now has the machinery thoroughly perfected, and is ready and willing to guarantee its working. I am seeking more light, and that is why I came here from "suffering Kansas."

Mr. J. H. Decker (Hannibal, Mo.)—I would like to ask Mr. Burns

whether, during his connection with the Pullman Company, he has had a death from suffocation, or from the gas in any way. If so, how many?

Mr. Burns—I will state that we have had two deaths. We had two fellows who went to a neighboring town, and got full of bad whiskey, came home and blew out the light, went to bed and woke up dead the next morning.

Mr. Decker—You were my predecessor at Hannibal, and you made as much, or more, coal gas there as you have made water gas at Pullman.

Mr. Burns—I think not.

Mr. Decker—Did you ever have a death from coal gas in Hannibal?

Mr. Burns—No.

Mr. Decker—I have been there for three years, and have made considerably more gas than you have made at Pullman, and I have not had a death yet. Littleton was there before I was, and he had no deaths.

Mr. Burns—That is all right. I will tell you how we came to have those deaths. When we started to build the City of Pullman, and during the time of building it, we had about the worst class of tramps coming there to get work that it has ever been my fortune to see. They would work only long enough to get some money, then get full of liquor, use their money up, then come back to their boarding-house and stay till they were sober enough to get more work. We have now got them all weeded out; we got rid of this class as soon as possible. Two of that class of men got themselves full of whiskey and came home and blew out the light. They were ignorant Swiss, and had been here but a little while. Whether they knew anything about gas or not, I cannot say.

Mr. E. L. Brown (Chicago, Ill.)—Would not coal gas have had the same effect?

Mr. Burns—It would have had precisely the same effect.

Mr. Fullager—While I have no opposition to water gas in any way, yet we need only go back to 1865, in the history of its use, when the first water gas company was started in Elizabeth, New Jersey, and where they made 6 feet of gas to a pound of coal, to recall the fact that those works had been going only two months before one or two deaths were caused by the gas. Afterwards, in Yonkers, the process was started; and there, within the last five years, there have been ten deaths from breathing the carbonic oxide from water gas, to where there has been one death from the inhalation of coal gas. Compare the statistics in the City of New York as between the Municipal and the other companies. I think there have been 100 deaths to 1 in the City of New York since water gas was introduced there. You can trace the same results all over the world, wherever water gas has been introduced. Examine the French statistics and you will find that the water gas process was driven out of the country. It is all very well for Mr. Smedberg and Mr. Burns to say that carbonic oxide will not kill a man, and that the difference between the two gases is only the difference between arsenic and strychnine. It is the difference between arsenic and flour in respect to its power. I have had men knocked down in my works by the gas; we carried them out into the air, and they soon got over it. But that was not the case in the Yonkers works when the men were knocked down. I had a man knocked over in the meter, but he got over it. In Yonkers three men died from breathing the water gas. We see the same effects wherever water gas has been introduced. The statistics show then.

Mr. Burns—The statistics also show that three men went into the purifying cellar of the works at Marshalltown, Iowa, and their superintendent with them, and they were brought out dead. That was from coal gas.

Mr. Decker—I happen to be very well posted with regard to Marshalltown. Those men were in a close cellar with a 2-inch pipe open until the holder had discharged 15,000 feet of gas into the place. It is a different case from that of Yonkers where the men were exposed to the gas only for a few minutes. Those men were in the cellar from 11 o'clock till 5 before they were discovered and taken out.

Mr. S. H. Douglas (Ann Arbor, Mich.)—I would like to say a word with regard to the poisonous effects of water gas and ordinary coal gas. My profession is that of a chemist. I have followed it for 30 or 40 years, and I think that what I say ought to be received as true, especially as I shall only state what is universally admitted in all works on chemistry. Carbonic oxide is one of the most poisonous gases which we have to deal with. There are few, if any, gases which are more poisonous. It is a direct poison. Illuminating coal gas is not poisonous, except so far as the patient is deprived of oxygen. A person will suffocate from illuminating coal gas simply because of the absence of oxygen, which is the gas necessary to maintain life. Carbonic oxide, on the contrary, is directly poisonous. It is a direct poison when taken into the system. A comparison has been made between arsenic and strychnine. It is, to a certain extent, a good one. You may take a teaspoonful of arsenic without a fatal result; but take of strychnine what will cover the point of your knife, and death will follow pretty quickly. So far the comparison is a just one; but both are direct poisons. The arsenic is poisonous, but strychnine is a hundred times more poisonous. In the case of carbonic oxide and illuminating gas, there is this difference: the one is a direct poison, while the other is a poison because it deprives the air of the oxygen which is necessary to sustain life.

Mr. Somerville—A matter of even greater importance is the great difference in the specific gravity of the two gases. I have determined the specific gravity of the gas for experimental purposes. Whereas the specific gravity of coal gas is about 400, if I take 13 per cent. of water gas it rises to 500 or 600. As the specific gravity of coal gas is 400, it follows that it will ascend very rapidly, if there be the slightest opening in the room. But water gas, with a specific gravity of 600, has no tendency to ascend; it falls right down to the level of the person who is breathing it, and that is why it so surely kills. We ran our works for 30 years, and never had a death from coal gas. In the five years we have been running the water gas process there have been two deaths, and two have been very badly suffocated. I consider this difference in specific gravity a very serious matter.

Mr. Smedberg—I wish to ask Mr. Somerville whether he is posted as to Dalton's law of the diffusion of gases. According to that law it results that the tendency of all gases to mix is directly as their *difference* of specific gravity. In other words, carbonic oxide being a heavy gas may sink momentarily to the bottom, but by what is very similar to the capillary action, it will mix more quickly with atmospheric air than coal gas. Water gas having a specific gravity of 600 will mix more quickly with atmospheric air than coal gas, which has a specific gravity of 400. The statement looks like a paradox, but it is a well-known law of chemical physics.

Mr. Smith—I have not had a great deal of experience with water gas; but I tried the wood gas for over a year. Some parties came to me and said that they could make gas for only a few cents per 1,000 feet, and I gave them facilities for working the thing out; but the results were not altogether satisfactory. I think that unless there is some great object to be gained by the use of water gas, not yet apparent, the nearer we keep to coal gas and try to improve and get out of it all we can, the better it will be for us and for our companies. If we can get 18-candle gas, at a reasonable price, we shall get along and do well enough.

Mr. Burns—I had no idea that my paper would call forth a discussion of this kind, as to the relative merits of water and coal gas. I merely desired to give you the results of what we have been doing at Pullman since we started; but I have been very glad to hear the discussion. I am like all the rest of you. I want all the light I can get; and I want it as often as I can get it.

Mr. Somerville—I would like to ask Mr. Smedberg why my men, when they go to stop a leak in the Lowe process pipes, dig a trench twice as wide as they do when stopping a leak in the coal gas pipes. The men have no scientific knowledge, and do not profess to have any, as to the relative effects of the two gases; but they instinctively provide a way of escape whenever they have anything to do do with the Lowe gas.

Mr. Smedberg—I presume they do it because they have been told to. In the transfer, to which I have referred, of 2,000 services from coal gas to water gas, not one man lost his life, or one day's work, because of inhaling the gases in the process. I know that the men who were engaged in this transfer say that no one was seriously injured, and no one lost a day's work.

Mr. Fullager—Does Mr. Smedberg know of a case in a coal gas company, where any man lost a day's work in transferring services?

Mr. Smedberg—I must defer to Mr. Fullager for information upon that subject.

Mr. Burns—Does Mr. Fullager know of any place where they transferred any services from water gas to coal gas?

Mr. Somerville—Putting in services would be just the same thing. I never knew a man to get knocked down by coal gas while putting in services. I have had men tap a 2-inch hole in a 20-inch main, and they were not troubled any. But you could not do that with a water gas main. I know that from experience. I have had to do with the Stephens process, with the Gwynne-Harris process, with the Conkling process; and I have been through them all, and have seen the same trouble from all of them; the men could not do this work; but they do it with coal gas.

Mr. Smedberg—I wish to give you one instance with regard to what coal gas will do. In January, or February, 1861, before we changed our manufacture to wood gas, the Confederate authorities ordered a balloon ascension from Savannah. I had given orders the night before that not a thing was to be touched till I came to the works in the morning. The operation was a simple one; to shut off a valve, open a 6-inch pipe, tie the bag over its flange, and open the valve again. My foreman, of course, thought he knew all about it, and would dignify his office by doing it himself. At 20 minutes past 4, 20 minutes ahead of my appointment, I came into the works and found two dead men. They had not been exposed to the gas for 10 minutes. One of them broke his neck by a fall of 28 feet into the dry-well. The other was caught by his cheek bones, between an iron flange on the one side and a brick wall on the other, and he had there writhed and twisted until he had cut one of his arteries before they could get him out. Now, I am exposed to

this dilemma; it may be said that one man broke his neck, and the other cut his throat; but nevertheless there were the two dead men lying on a plank. I do not pretend, for a moment, to say that water gas would not have done the same thing. What I do respectfully object to is this continual prating of the innocence of coal gas; and what a good thing it is to inhale; and what a safe thing it is for a man to stand before an open 3-inch pipe and breathe it in for an unlimited time.

Mr. Douglas—I have one word more to say with regard to the poisonous effects of carbonic oxide. It seems to me that, in the discussion of this question, we have lost sight of one fact, and that is—admitting that carbonic oxide is poisonous, what are the circumstances under which carbonic oxide is formed. Is it formed, or is it not formed, in water gas? Every chemist knows that when a stream of atmospheric air is blown through incandescent carbon carbonic oxide is the result of the combustion. I take it that this is precisely the condition under which water gas is formed. In the process carbonic oxide is largely formed, and this carbonic oxide, a combustible gas, is chemically charged with naphtha. Water gas is really a gas composed largely of poisonous carbonic oxide. Illuminating coal gas is not thus formed; it has not the same composition; it is not, as I have already said, directly poisonous; but is poisonous because it deprives the atmosphere of the oxygen necessary for sustaining life. Now if, in the formation of water gas, carbonic oxide is one of the necessary results of the process itself, then water gas must be vastly more deadly that the ordinary coal gas. It must be so of necessity. I state this not as my own opinion merely; it is an opinion, which is endorsed by every work on chemistry.

Mr. Smedberg—I think the chemical evidence is not exactly as Professor Douglas states it. I am myself a living proof that carbonic oxide does not kill. I have had a good dose of it, and I know that I am as sound a man today at fifty as I was at twenty. I do not care if a dozen chemical books tell me that I am a dead man. I am not dead.

Mr. Burns—I would like to say one thing more. I would like to as some of the coal gas men if they have any idea how many deaths resulted from coal gas when coal gas was as young as the water gas process now is. The water gas process is a young giant. It has jumped into public favor almost as rapidly as has the electric light. There are now over 100 water gas companies in the country. Coal gas has been in use at least six times as long as the water gas, which we are now using for the purpose of illumination; and in that time we all know that many deaths have occurred from coal gas. Many people were suffocated by coal gas before the people were educated to its proper use. Is it not a perfectly fair proposition that we can educate people to using any other gas with safety, whether it be coal gas, water gas, or what not. If we can make water gas cheaper, if we can make it as good an illuminating agent, why can we not educate people to use it just as, years ago, we educated them to use coal gas?

Mr. T. A. Cosgrove (Evanston, Ill.)—I think the question of the Lowe process gas has been about exhausted, and if we have any other business of importance we had better proceed to it.

REPORT OF COMMITTEE ON PRESIDENT'S ADDRESS.

The Committee on the President's Address reported, recommending that the address be incorporated in the proceedings of the Association.

On motion the report of the committee was received and the recommendation adopted.

Mr. G. G. Ramsdell, of Vincennes, Ind., read the following paper on

STATE ORGANIZATION.

My apology for this article, if any be necessary, lies in the fact that Indiana gas interests have recently escaped a pernicious law, of which I shall speak farther on, but whose unwelcome proximity has suggested the following thoughts.

It is not difficult to see that in all lines of business, the tendency of the times is toward consolidation, and in many lines at the present day success depends for its measure upon the extent of capital employed and its equivalent increased capacity.

And while these large affairs increase about us, a corresponding opposition is engendered which promptly clothes them with the comprehensive name of monoply, that it may more thoroughly antagonize their interests and the more readily obtain the legislative ear, and in many cases, whether right or wrong, seriously embarrassing and depreciating the value of investment.

In the matter of opposition the gas industries may easily claim to be pioneers, and are peculiarly subject to the legislative phrase of it.

The recent abortive effort to carry through the Indiana Legislature a bill creating a most lucrative office at the expense of the gas companies of the State, has strikingly brought this to mind and has shown not only the benefit to be derived from, but the actual necessity of, a coalition of interests in a State organization formed for mutual advancement and protection.

None of the so-called monopolies are treated with such tender solicitude by the average legislator as the gas industry, and probably none are so illy prepared to meet the issue.

Those having charge of our railroads understand this, and every session of our legislature witnessess their adroit manipulation to secure favorable recognition, and while the gas industry has no such available means for enlisting favor, and while it is a questionable proceeding to use such means, it has the more potent power if its influence be properly applied, and the integrity of its position well defined.

In the light of recent developments, these are not so much matters of the future as they are present evils, and when we consider that nothing so tends to impair the actual value of gas investments as this constant uncertainty of "things present and things to come," their importance is attested

There is not enough profit in the ordinary legitimate gas holdings to justify stockholders in assuming extraordinary risks.

Were the business yielding enormous dividends, and all but those who know, think it is, then men could afford to hazard their capital; but a stock that is yielding from 8 to 12 per cent. dividends, and subject as it is to unusual hazard and restrictions, owing to the nature of the business itself, should not be compelled to undergo the additional disadvantage of unjust legislation. Besides this, these contingencies must be considered, and play an important part, against the consumers' interests when we consider the matter of a reduction in the price of our gas.

The history of the industry admonishes us of these things, and while we may already feel the influence of active competition, yet that forms an incentive to increased energy in the improvement of our methods and business management, but unjust legal restrictions are not so easily met, or so readily overcome.

No amount of executive ability in the management of our works can offset what a day might bring forth in our legislative halls, and it is only, in all probability, a question of time when our interests must in all of the States be benefited or jeopardized by just such influences.

The temptation to wield a free lance in this direction is greatly enhanced by the fact that the gas companies afford a most susceptible target for men who seek to bolster up their own claims in the eyes of their constituency, so that it becomes all the more dangerous to the best interests of our industry, with its immense invested capital, and it must be subject to a large extent to the caprices of men who, proficient in ordinary legislative duties, are as a class comparatively ignorant of the best interests of gas consumers and gas producers, jointly, and many of whom wilfully or maliciously ignore our claims for equal justice altogether.

I take it for granted, there would be no objection interposed on the part of any one interested in gas stocks, to any law or laws that were alike equitable to all concerned, and perhaps no consumer would more gladly welcome such laws than would those interested in supplying his wants.

Owing to the greater experience of the old world, this country has the advantage of that experience in the practical test of the laws already in force concerning gas interests, and can with profit choose such as are time-proven as regards equity and utility and do much towards securing their adoption by intelligently demonstrating their value.

The day when gas companies have no rights which legislators are bound to respect has gone by. The gas companies of any State embrace in their list of stockholders men of undisputed influence, whose integrity and honesty are attested, and to such an extent does this prevail, that it is scarcely possible that any bill can be enacted which is not just and equitable to all concerned, provided this influence can be utilized and brought to bear intelligently and honorably, and with the added strength of unity at the proper time and place.

While the present condition of things could not warrant a literal interpretation of the old adage, "United we stand, divided we fall," yet it would warrant the statement that in union there is strength, that should prevent our falling into ways that are not ways of pleasantness and peace.

It is easier to defeat improper legislation than to effect its repeal, therefore if occasion arises where it is to the interests of gas companies to advance or antagonize any special legislation, the most opportune time is before the evil is consummated or the benefits are defeated.

I am far from meaning by this that it would be to our interests to have anything bearing the appearance of an organized lobby, or indeed that the companies of a State should be organized with the sole object of affecting legislation one way or the other; but experience has shown that we are liable to attack under the guise of beneficiary legislation for consnmers, in such a manner as would prove exceedingly costly, and not only annoy and harrass us but be of no value whatever to those whose interests are supposed to be protected; and without doubt the future will develop many schemes with carefully modulated phraseology but equally incapable of furnishing the so-called protection.

If we are to have laws regulating and controlling our invested interests, it is certainly of the utmost importance that the gas companies should so far control the making and enacting of them that their interests may receive equal protection with their consumers. This is all that should be wanted or desired by either party, and all, I feel sure, gas interests would seek to secure.

Fortunately the case alluded to in this paper was so plainly unjust that no organized effort became necessary to accomplish its defeat.

The bill was computed to yield those interested $200,000 in three years, a sum equal to a tax of 20 cents on every thousand feet of gas manufactured in the State during the same period—an amount which, if levied, would prove a very serious matter and necessitate an increase in price or leave stockholders without dividends, either alternative being presented in a straightforward, business-like way being sufficient to prevent the legislation.

The trouble, however, arises just here, from the fact that while all are interested, yet without an organization to effect the purpose, the business of all being the business of no one in particular, the work goes undone; this could very easily be corrected through an organization with an executive committee clothed with power, whose duty it would be to act in the premises.

My object in preparing this paper has been simply to call the attention of those interested in the general welfare of the business to the necessity of being prepared and suitably equipped for emergencies when they arise, instead of wating until too late to do effective work.

Of one thing there is little doubt—laws will be enacted not only attempting to control the perfect rectitude of the consumers' meter, but in all probability controlling capital and dividend, and those interested cannot afford to sit idly by and allow laws that would cripple our usefulness or efficiency to be enacted.

Mr. E. J. King (Jacksonville, Ill.)—I move that a committee of three be appointed by the Chair to consider the subject brought forward in Mr. Ramsdell's paper, to report at the next meeting.

The motion was carried, and the President appointed, as such committee, Messrs. E. J. King, Jacksonville, Ill.; R. Spencer, Burlington, Iowa; and G. G. Ramsdell, Vincennes, Ind.

The Association then adjourned, to meet at 7:30 P.M.

FIRST DAY—EVENING SESSION—MAY 9.

The Association assembled at 7:30 P.M.

Mr. Ramsdell, Chairman of the Nominating Committee, presented the following report:

Your committee, appointed to nominate officers of the Association for the ensuing year, submit the following report:

For President—J. B. Howard, Dubuque, Iowa.

For First Vice-President—Thomas G. Lansden, St. Louis, Mo.

For Second Vice-President—James Somerville, Indianapolis, Ind.

For Secretary and Treasurer—A. W. Littleton, Quincy, Ill.

For Board of Directors—R. Spencer, Burlington, Iowa; Frank Beck, Galveston, Texas; John Gimper, Leavenworth, Kansas; Thomas Smith, Grand Rapids, Mich.; G. A. Hyde, Cleveland, Ohio; T. A. Bates, Cairo, Ill.; Samuel Prichitt, Nashville, Tenn.; Wm. Wallace, Lafayette, Ind.; J. Fullager, Cincinnati, Ohio.

The President—I think the committee have made one mistake in their report—that is in the nomination of the first officer. I had hoped that some other member would be named to take my place. I believe in rotation in office.

On motion of Mr. Spencer, the report of the committee was accepted.

On motion of Mr. Ramsdell, the Secretary cast the ballot of the Association for the nominees, and they were declared duly elected officers of the Association for the ensuing year.

The President—Gentlemen, I return you my sincere thanks for the honor which this Association has now conferred upon me for the second time. I will in the future, as in the past, do what I can to further the interests of the organization. It is proper, I think, in this connection, to speak of the efforts of our worthy Secretary, in order that credit may be given where credit is due. The success of this meeting is largely due to his indefatigable zeal and exertion. [Applause.] Again I thank you for the honor you have conferred upon me. We will now listen to a paper by Mr. George Shepard Page, of New York.

Mr. Page thereupon read the following paper on

THE BOWER-GRIMSTON REGENERATIVE GAS BURNER.

During an interview with Walter King, the publisher of the London *Journal of Gas Lighting*, last August, I asked him what was the latest invention pertaining to the gas industry. He replied, "The Bower-Grimston burner," and introduced to me a member of his editorial staff who had recently seen it. He described its principal features, making a pencil sketch of the construction, and informed me where it was on exhibition. Without delay I visited the office in Victoria street, and found the burner attached to a pipe in the center of the ceiling. The room (20 x 15) was darkened, and the gas turned on. A brilliant light illuminated the apartment, the flame assuming the graceful form of the bell-shaped flower convolvulus. The light was clear, powerful, and steady, coming from an inverted Argand, without interfering arms, brackets, or other attachment to obstruct a single ray. It seemed absolute perfection in the consumption of gas for indoor and outdoor illumination, and the exact apparatus to be used in competition with the arc and incandescent electric lights.

Not long after I met Mr. George Bower, of St. Neots, the owner of the English and other patents—a gentleman widely known as the builder of more gas works than any other individual or corporation, having constructed them in the United Kingdom, Europe, Turkey, Persia, Africa, Asia, Australia, New Zealand, and South America. He is also one of the inventors of the Bower-Barff process for treating iron chemically, by which it is absolutely proof against corrosion or oxidation; and his son, Mr. Anthony S. Bower, has added important improvements to the Grimston burner. He stated that the burner I had seen was the very first one constructed, and promised to send me one later on. I received it recently, and have the pleasure of exhibiting the first one to come to the United States before the gentlemen of the Western Gas Association.

I have watched with deep interest the development of this burner, and the columns of the London *Journal of Gas Lighting*, and other authorities, have commented upon it from time to time with the highest commendation. A company, with a capital of £100,000 ($500,000), the chairman of which has for some years been the chief officer of the largest gas company in the world—the Gas Light and Coke Company of London—has been created to manufacture and sell them.

At the recent Electric Light and Gas Exhibition, at the Crystal Palace, this burner created a sensation—eclipsing the most powerful electric light. Speaking at a recent meeting of the Gas Light and Coke Company, Mr. George Livesey, the distinguished gas engineer, said many things with a view to inspire confidence in the minds of timid gas proprietors. Among others, he mentioned the advances now being made by inventors in regard to improvement in the appliances for developing the illuminating power of gas, with special reference to this burner, passing a very high encomium upon it. This expression of opinion, by such an authority, is sufficient to arouse deep interest in the apparatus.

Before proceeding to describe the invention, a brief history may be interesting of how it happened that Mr. Grimston, an electric lighting engineer, became a gas burner maker. The story will undoubtedly help to explain the reasons for many of the characteristics of the new burner. It appears, then, that Mr. Grimston, who was connected with the electrical engineering establishment of Siemens Bros. & Co., Limited, was some months ago shown the construction and working of the Siemens regenerative gas burner, which is now sufficiently well known to render a description unnecessary here. In common with most spectators of this very ingeniously and philosophically designed appliance, Mr. Grimston was struck with its bulk, and the superficial clumsiness of the arrangement whereby the air and gas supply are heated in it by the products of combustion. These lamps have, of course, been materially improved of late; but when Mr. Grimston first saw them, perhaps 18 months ago, they certainly could not be called neat and compact in design. He at once grasped the idea embodied in these lamps, and set about constructing an arrangement which should be based on a similar principle, but, at the same time, avoid the inconvenience complained of. It is not too much to say that he has succeeded in both these aims; and the burner that now bears his name strikes the observer at once by the brilliant light which it produces, by the simplest and most obvious means.

By reference to the illustration and burner we see how Mr. Grimston produces the regenerative effect, which is likewise the central idea of the Siemens burner. The light is simply that produced by an arrangement of a kind of Argand burner turned upside down. The central gas pipe is connected with a distributing chamber, whence the annular cluster of brass tubes is prolonged downward, forming the burner. The burner is inclosed in an iron or brass annular casing, which forms the main framework of the apparatus. The annular space which it affords is the outlet chimney or flue for the products of combustion of the burner beneath, being intersected by air passages leading from the outer air to the inner space containing the burner tubes already described. The upper openings of the annular body communicate direct with the chimney proper. The burner is lighted by opening the glass cover, which fits practically air-tight on the bottom of the body, so that the air needed to support combustion must all pass through passages, the outer ends of which are protected by a casing. When the gas is lighted at the burner and the glass closed, the burner begins to act at once, although some minutes are necessarily required to elapse before its full brilliancy is gained. The cold air passes through the passages provided for it, and when these are heated to the fullest extent on their outside by the hot fumes from the burner, they so readily part with their heat to the air that a temperature of 1,000° to 1,200° F. is easily obtained in the air when it arrives inside, and commences in turn to heat the burner tubes. The air passages are placed so as to intercept the hot gases as completely as possible, and also, of course, obtain heat by conduction from the sides of the annular body. It is evident that the number and dimensions of these passages might be increased so as to abstract almost all the heat from the escaping fumes, but for the limitations imposed—firstly, by a consideration of the actual quantity of air required to

support combustion; and secondly, by the obligation to let sufficient ascensional power remain in the gases which are left to pass out through the upper chimney. If the gases are cooled too much they will either fall back into the lamp and extinguish the flame, or will be removable only by the draught of a long chimney. It will probably be the aim of the inventor to balance these requirements, and so produce burners with very short or long chimneys, accordingly as appearance is to be consulted, or the highest possible effect produced.

The burner is a ring of brass tubes of considerable diameter, in proportion to the quantity of gas consumed; and this provides for the delivery of gas expanded by heat. The flame can be described as hot gas burning at an extremely small velocity of flow, and wholly exposed to view from the exact point it is desired to light. In this latter respect it differs materially, and with advantage, from the Siemens burner, which, while presenting an extremely brilliant and beautiful ball of flame outside its central tube of porcelain, may yet be tailing smokily downward inside the opaque screen, thereby causing unperceived waste. The flame of the Grimston burner, on the other hand, is quite exposed, and all its light, from the end of the burner tubes to the point where visible combustion ceases, is made available for use. As a perfect Argand flame in the usual position has been likened in form to a tulip flower, so the flame of this burner presents the appearance of an inverted convolvulus.

So far as he has already gone, Mr. Grimston prefers to keep the tubes of the burner at such a distance from each other that the several jets part at the point where they turn upward, so that the convolvulus figure is not maintained to the edge of the flame.

From its peculiar position the light is, of course, completely shadowless as regards the lamp which affords it, and this of itself is no small recommendation for a pendant. It shows well for the simplicity and effectiveness of the perfected burners that Mr. Grimston's experimental example, although necessarily imperfect in many ways, burns with a remarkably steady light of great brilliancy, which is assured by the fact that the products of combustion are robbed of all their heat to magnify the useful effect, so that the hand may be borne with ease over the outlet of the chimney.

With respect to the endurance of the apparatus, it will be sufficient to remark that there is nothing in the gas or air heating arrangements to get out of order, and they are all easily accessible while the burner is in action. The glass is not liable to breakage, although it is in close proximity to the flame, as may be gathered from the testimony of the inventor, who has never broken one, notwithstanding the severity of some of his experimental studies upon his first lamp.

The consumption of gas in the first working model burner made by Mr. Grimston was 10 cubic feet per hour, and the illuminating power averaged 60 candles. The diameter of this burner was 1¼ inches across the tubes. It is scarcely necessary to state that if this high duty, which was obtained with the ordinary 16-candle gas of the Gas Light and Coke Company, can be maintained, to say nothing of being exceeded, in the commercial article, the Grimston burner, with its other advantages over all existing methods of obtaining equal results, has a great future before it. For example, it does not require a separate air supply under high pressure, or any extra material to render incandescent, and it may be turned on full immediately upon lighting. It throws a shadowless light, and lends itself to ventilating arrangements; and it is not by any means cumbersome, delicate in construction, or costly in manufacture. One of the greatest advantages to which it lays claim is, however, the power to yield almost as good results in a small burner as in a large one. This is a consideration of great moment, when it is remembered that the tendency of most of the high power burners hitherto introduced is to benefit the lighting of streets, large interiors, and points of great consumption. Meanwhile the private consumer, using 3 to 5 feet of gas per hour, has been left to attain, as best he might, by the use of burners, excellent of their kind, to the maximum effect of the standard argand. Now Mr. Bower seeks to make the small consumer partake of the advantages heretofore reserved for the wholesale user of large and costly Siemens and other lamps.

Gas companies, as Mr. Livesey has expressed it, will be content with a slower relative growth of consumption, if their consumers are, at the same time, making their gas go as far again as formerly, by the use of burners which turn nominal 16-candle gas into gas of 30-candle actual illuminating power. It is very evident that Messrs. Bower and Grimston have shown how Frederic Siemens' scientific principles of regenerative gas burner construction can be carried out in another way. There is nothing more common in industrial annals than for one man to begin a work which another is destined to bring to greater perfection.

Having read his paper, Mr. Page exhibited a specimen of the burner, and after explaining its construction went on to say—

Those of you who have kept informed of the economical and best use of gas upon the other side of the water cannot but have remarked how extensively the heat of gas has been compelled to perfectly ventilate some of the largest halls and buildings in England. The Reading Town Hall is unquestionably the best lighted and best ventilated hall in the world; and the ventilation is secured entirely by the use of the heat generated by the gas. This tube can be carried over into the flue of the chimney, or to any other convenient point. I think here is an advantage pertaining to the use of gas, which has perhaps escaped the attention of many manufacturers, as well as of many consumers of gas. The claim made by the electric lighting companies—that they do not heat a room—is one of the very worst features concerning the use of the electric light; it does not heat the room, and therefore causes no change or movement of the air in the room. The incandescent light cannot possibly aid ventilation in that way. This burner, without perceptibly increasing the temperature of the room, causes a very perfect ventilation. If this burner, with a power of 75 candles, were now lighted, there would be no increased heat in this room in consequence of the combustion of gas. It is not necessary to have the chimney extended out of the room, unless ventilation is desirable, for, of course, the products of combustion do no greater injury from the use of this burner than they do from an ordinary burner.

Discussion.

Mr. Burns (Pullman, Ill.)—How much gas will that burner consume?

Mr. Page—This consumes 10 feet per hour; 7½ candles per foot.

Mr. Burns—With what pressure?

Mr. Page—With the ordinary pressure. The larger burners, of course, give greater power. I am assured that burners of 50 feet give 500 candles per hour.

Mr. T. Smith (Grand Rapids, Mich.)—Why can you not put that in operation here this evening?

Mr. Page—Mr. Fullager has kindly offered to have one of his gas fitters come and attach it to one of the brackets, so that it can be ready for use at the meeting to-morrow evening. I have thought it would be more interesting to you to see the interior of it to-night, and thus get a knowledge of it; so, instead of acting upon his suggestion to light it to-night, I suggested that it would be better to wait till to-morrow evening.

Mr. A. W. Littleton (Quincy, Ill.)—What will the lamp cost?

Mr. Page—Those that have been made thus far—probably 100 in all—have been distributed; I do not suppose that any have yet been sold. Gas companies have been sending for them from all over Europe, and many from this country. The cost will be very slight; there is nothing about it but glass and iron, except this little brass attachment and the brass tubes. The great expense attending the introduction of other burners, such as the Siemens, will not stand in the way of the introduction of this lamp.

Mr. Smith—How many candle power is that?

Mr. Page—This is 75.

Mr. Smith—Do you know how high they have run the candle power?

Mr. Page—The largest one that has yet been made is 1,300 candles. Of course, they can be made of 5,000 candle power by simply increasing the diameter.

Mr. J. Fullager (Cincinnati, O.)—Would there be any danger in burning water gas in that?

Mr. Page—This is one of the few things that are just as applicable to water gas as to coal gas. I think we can join hands with Mr. Burns on this burner, although we never should on residuals. You will notice that the rim at the top fits against this head, and prevents the air from passing out after it has passed in through this wire. There are three layers of wire, and those wires pass down in between these openings. The air, therefore, is finely subdivided. One of the most important principles in the construction of the regenerative burner is the division of the air. You now see the tubes. The gas, entering here into this chamber, is distributed through these 12 tubes. Of course, at first, as the current is drawn in from the outside, the flame turns up as it burns; but as the air is drawn in here, the flame turns down alongside of these tubes, and the current gradually increases till it sucks the gas out, and any form of flame can be created that is desired. In one of the lamps they produce an exact sunflower shaped flame. As the heat increases the whiteness of the light increases. No air is allowed to pass in under the globe, save a slight current; and this is an extremely ingenious improvement in the invention of Mr. Bower. A slight current of air is allowed to pass in through a crevice in a brass fixture, which passes up at the side of the glass and keeps it cool, or aids in preventing it from being broken by the heat.

Mr. E. J. King (Jacksonville, Ill.)—Can you give an estimate as to the comparative cost of illumination by that lamp and by the electric light?

Mr. Page—I will answer that question in this way: The friends of whom I spoke, who traveled all the way from Ohio to New York to find out the cost of water gas, stopped at Baltimore, and they there met Mr. Hall, the President of the Consolidated Company, and among other things he said to to them, "I will tell you a most remarkable thing. I sent a communication to the Council of this city, offering to reduce our contract price for gas from $1.90 to $1 per thousand, making it uniform in price to the general consum-

er. Our contract has five years yet to run. Would you believe it," said he, "they declined to accept the proposition. One hundred thousand dollars was offered to the city of Baltimore, and they declined to accept it." He said that it became noised about that this proposition was going in, and there was, in consequence, great uneasiness in the electric light circles. I do not know what the influence was which prevented the acceptance of that proposition; but the question is pertinent—If the electric light company cannot compete and make money as against gas at $1.75, how can they at $1.

Mr. J. B. Smallwood (Baltimore, Md.)—I can probably explain that. This contract was made in 1880, for the term of five years, at $1.85 per thousand feet, with the condition on the part of the gas company to lay at least $10,000 worth of gas mains every year. When they got into this gas war the new company proposed to furnish gas at $1 per thousand. Our Council thought that if the people would save so much per year, they had better investigate the question. The City Council accordingly passed a resolution calling for the opinion of the city solicitor relative to the validity of the contract. In his opinion he stated that the contract was invalid, for the reason that one City Council had no right to bind another City Council in the matter of a contract for gas. During this time, and before the City Council took any action on this subject, the gas company stepped in and said to them, "Gentlemen, do not act upon that resolution. We will make the concession, provided you will allow us to withdraw from that requirement of the contract for putting in the mains." The committee on finance, to whom the matter had been referred, very properly rejected that, because otherwise their contract would have been accepted and acknowledged by the city. They rejected that part and left it standing as it was; but I understand that they propose to pay them but $1 per thousand feet.

Mr. Page—I stated the matter just as it was told to me by these gentlemen from Toledo, Ohio. As I have now mentioned the city, I may say that they gave me permission to mention their names as authority for this statement, and I will give you the names of the gentlemen and refer you to them—Mr. Backus, Mr. Faben, the superintendent, and Mr. Berdan. Those gentlemen gave me the statement that I have made. I asked a second time that the statement should be made to me, because it seemed to be such an exceedingly strong argument, and as showing so conclusively the impossibility of the electric light competing with gas, that I desired to put it upon record; and they gave me permission to do so and to use their names.

Mr. Smallwood—That is just the condition in which it stands to-day. The Baltimore City Council made a test of the question in the courts, as to whether the contract was a valid one or not.

Mr. Page—If necessary, I could give you a score of instances in which the electric light companies have failed to compete with gas at $2.25. In a contract recently made by a common council, the electric light companies (the Brush and the United States) are paid $120 per year more for the electric light than had been paid for the same light when furnished by a gas company.

Mr. King—My question was simply with regard to the large lights.

Mr. Page—If gas can be burned as economically as it has been proved to have been burned, and increasing the power of the light so greatly as is done by this lamp, there is no chance for the electric light in competition with it.

Mr. Smallwood—Do not understand me to say, by any means, that the electric light company do not rejoice at the result. Our electric lights were costing about four times the cost of gas.

Mr. Page—I am very glad to hear the statement of my friend from Baltimore. It is quite possible that, in the transmission of the statement from these gentlemen, some features of it may not have been carried correctly. I do not wish to occupy any more time unless there are further questions.

Mr. Littleton—Can you give us an idea of how much gas would be required, say, for a 1,000-candle burner?

Mr. Page—Multiplying it by 10 would give 100 feet per hour per thousand candle power.

Mr. Littleton—Does it follow the same ratio all the way through?

Mr. Page—No; it has been proven that the larger you increase the principle the better results are obtained. There is probably a limit, but the limit must be very far off. You have probably read the statement that even some of the Argand burners do not utilize one part in 100 of the lighting units. Therefore, the possible developments in the direction of burning gas are almost as unlimited as in the direction of making it.

Mr. Burns—About what time do you expect that those lamps will be procurable in this country? I would, for one, like to experiment somewhat with it. I will state that I have two large sun burners in our Arcade; they are a downward light, with a sun-burner underneath; but they take an immense amount of gas; and I think if that burner will give a 60-candle power light, with 10 feet of gas, we can effect a very large saving by using them in place of the sun-burners.

Mr. Page—I will state, in reply, that Mr. Bower has said that he would send over a consignment of ten or twenty lamps, in from four to six weeks; but the intention was that they should be distributed among different gas companies in order to test them thoroughly. How soon any will be for sale, or what the cost will be, I cannot state at present; but expect to be in receipt of more definite information in five or six weeks. I know that by this time a large manufactory on the other side is probably equipped for their manufacture. It is not expected that they will be imported into this country; but they will be manufactured on this side, certainly as early as the coming fall.

Mr. J. Somerville (Indianapolis, Ind.)—I do not fully believe in the principle of large lights. It seems to me sometimes that we are going on the wrong track, and that we are copying the electric light to our disadvantage. The beauty of gas is that it can be subdivided and placed just where it is wanted. No doubt there are places where a large light is of service, although I have never yet seen such a place. I have had a 400-candle power burner on exhibition for over a year; it is a splendid light; for a distance of 30 or 40 feet round the light is so bright that you can read a newspaper; but it occurs to me, whenever I see it, that the light is wasted. I do not think there is any economy in having such large lights.

Mr. Fullager—Do you not think it would be economy to take a 10-foot burner to light this room, instead of using 70 feet per hour as we are doing. Would there not be economy in that?

Mr. Somerville—Undoubtedly.

Mr. T. A. Cosgrove (Evanston, Ind.)—If there is nothing further to be said upon this subject, I would like to make a motion that this Association tender its thanks to the following gentlemen for their very interesting papers read in our hearing: Messrs. G. A. Hyde, T. G. Lansden, E. J. King, G. G. Ramsdell, and George Shepard Page. The resolution was unanimously adopted. On motion the Association adjourned, to meet the following day at 9 A. M.

SECOND DAY—MORNING SESSION—MAY 10.

The Association met at 9 o'clock.

The President—We will now listen to a paper on "Furnaces," by Mr. J. Gimper, of Leavenworth, Kansas.

Mr. Gimper then read the following paper on

FURNACES.

Two years ago I read a paper before the Association, and had then to apologize for its length; to-day I have to apologize for its brevity. I do so, not because the subject is unworthy a longer paper, but because I desire that the points I have omitted shall be brought out by the discussion, which I trust will follow the few suggestions I have to make.

Mr. President and Gentlemen of the Association—The saying that the money to be made in a gas works must be made in the retort house, if made at all, is no doubt true. It is, therefore, of the greatest importance that the retort house, with its appliances, should be of the very best construction.

Last summer I was entrusted with the construction of a new producing plant for our works; and I was, of course, very anxious to get that which would be best adapted for a small works.

Two years ago I read, at your annual meeting, a translation from the German Gas Association wherein I tried to make one point at least clear, namely: That to produce a uniform good heating gas, a constant depth of fuel must be maintained, which should never fall below 18 inches.

With this fact before me I could not think of heating the new benches by the old method; and, nence, a deep furnace was decided upon. A retort house with a cellar 10 feet deep was constructed, with arches for benches of sixes. Furnaces 2 feet by 3 feet and the entire height of cellar.

The ashpan and grate bar surface are closed by a well-fitting door, in which there is a slide for the regulation of the needed amount of air under the fuel.

The furnace is built straight up to within apout 18 inches of our retort house floor level, when drawing in from the sides commenced and continued until an opening 14 inches by 3 feet is reached.

Behind the furnace is an air chamber, which connects, by a flue, to the front of the furnace near the bottom, and at the top is connected with a flue leading to the inside of the furnace. Through these flues and air-chamber the supplementary air for the complete combustion of the heating gases is conducted in to the furnace; and thus far the furnace is of the regenerative kind only.

To make it recuperative I adopted the following method: About 12 inches below the retort house floor level a flue passes horizontally back until it reaches just behind the upright bench-flue, thence it follows up said bench-flue as far as desired, and returns over a partition downward, until it meets a horizontal flue leading to the inside of the furnace. By this arrangement the supplementary air is heated only by the waste heat from the bench, and thus the bench becomes a recuperative one. By the use of either set of air flues, either system can be used. For the successful working of this plan a strong draught is necessary.

Above this furnace, and to each side, is the usual setting of six retorts, but

with this difference: that the spaces between the bottom and middle, and middle and top retorts are all closed, so that the space between the retorts forms a combustion chamber, and the heat has to pass upward and over, and thence down the sides of retorts, and out the usual manner under the bottom retort.

The firing of the furnace is done from the retorts direct through a shute in the floor level. The two bottom retorts are sufficient to keep up our heats.

A small jet of steam is allowed to enter below the grate bars, which has a two-fold object. First, it rots the clinkers and makes the attendance to the furnace a very easy matter, and second, the steam is decomposed into hydrogen, the highest heating gas in value, and into oxygen, forming carbonic oxide, and hence less atmospheric air has to be admitted; and thereby I do not load the furnace with so much dead gases or nitrogen.

Care must, however, be taken to admit the right quantity of steam, else you destroy the heats. The condition of ashes and clinkers will teach anyone when the right amount of steam has been used.

Previous to the use of this bench, as described, six-hour charges had been the rule, and still are with my neighbors who are using the same coal, it being quite hard to carbonize. Now, I have had no difficulty in carbonizing 300 to 320 pounds of coal per retort in four hours. The advantages of this bench over the old ones are very considerable. First, in that it increases the capacity per bench largely; second, it makes a great saving in fuel; and last, but not least, it is a very large saving in labor, and a longer life to the stoker.

[To be continued.]

[A paper read before the Central New York Gas Engineers Association.]

Ammonia.

By George Shepard Page.

It was said by the illustrious Liebig, that the degree of civilization of any nation might be accurately gauged by the record of the quantity of sulphuric acid consumed within its borders.

With this quotation for a text, a recent writer truly says that, "at first sight, this is a somewhat fantastic way of solving an abstruse problem; but the more carefully it is examined, the more completely does it satisfy all the conditions of a crucial test of economic progress." It was probably owing to reflection on this maxim that the late Earl of Beaconsfield cited the returns of the chemical trade as affording the best evidence of a revival of commercial prosperity in England.

Be this as it may, the maxim itself contains a deep truth which is well worthy of consideration and remembrance. For what does the extensive use of sulphuric acid by any nation really signify? Simply, that this commodity—itself a bye-product, and not long since wasted—is the chief agent whereby the waste and rubbish of the nation's industry is redeemed for other uses. A savage tribe spoil as much as they consume of the products of the earth which support their existence; and a people perfectly civilized may, without any great stretch of the imagination be supposed not to waste anything.

Between these extremes are to be found all the nations of the world at this time, and they are distinguished among themselves by the degree in which they approximate to the ideal of civilization.

It is, however, true that nothing is actually wasted. The ofttimes long but ever acting forces of nature out of decay bring forth new life.

Man cannot wait on nature for all things; hence, with this powerful agent sulphuric acid, he accomplishes in a few minutes that which would require ages.

The Indian, for centuries, left the carcasses of the buffalo exposed on the plains. The intelligent Anglo-Saxon gathers them by the thousand car loads, transports them thousands of miles, and, by the aid of sulphuric acid they are speedily converted into a subtance that fertilizes the corn, wheat and potatoes of the North, and the cotton, sugar, and tobacco of the South. But in this result a third factor is requisite, and again the hand of intelligence grasps a waste product.

One can hardly imagine a wider divergence than would seem to be presented by the supply of light, heat, and power in towns and cities, and the enriching of the exhausted soil of the country. Yet this is illustrated to a vast extent in Europe, and in a steadily increasing ratio in our own country. The sulphate of ammonia factory is an adjunct of the gas works; indeed, it is speedily assuming a position of importance second only to gas itself. The writer referred to goes on to say, "Surely, if the copious use of sulphuric acid be a sign of advanced civilization, a gas works where manure is also made, regarded from a sociological standpoint, must be in itself an epitome of the civilization of the nation! These are not idle thoughts; for it is allowable sometimes to take stock, as it were, of our industrial condition upon other basis than that of immediate profit and loss. It might have happened that the secondary developments of gas supply had been in directions not always nor entirely beneficial to peaceful industry. In reality, we see that these developments have resulted in placing gas makers prominently in the ranks of those benefactors of their species who help to make two blades of grass grow in place of one."

It is interesting, in view of the preceding, to inquire why ammonia (NH_3) which consists of three parts of hydrogen and one of nitrogen is found in coal. Geologists have, until recently, believed that coal was the result of the decay of vast forests which existed previous to the glacial period. But of late years scientists assert that it was created at the bottom of deep seas and formed of sea weed. This is proven beyond the possibility of a doubt from the facts that but few specimens of trees (less than 1,000 examples) have been found in all the coal fields of the world; many coal seams of an inch, and less, in thickness exist; the seas of the globe contain algae beds many feet in thickness; the distillation of lignite and peat, which are bog formations, yield acetic acid, also a wood product; whereas coal yields ammonia in large quantities, which finds its source in the vast quantities of animals that existed in the algae. Moreover, bromine and iodine, obtained from marine plants, are known to exist in coal soot.

Let us now consider the percentage of nitrogen and ammonia that coal contains. High authorities assure us that about two per cent. of nitrogen exists in coal, and that, when heated in a closed vessel, mostly comes off in combination with the hydrogen of the coal as ammonia. But Professor Foster, of London, has recently proved conclusively that as, in practice, 100 tons of coal are required to yield one ton of sulphate, that if the first statement be correct, the 100 tons of coal ought to produce 9.4 tons sulphate—each unit weight of nitrogen being represented by 4.7 units weight of sulphate of ammonia. Professor Foster tersely says, "that as most coal does contain about two per cent. of nitrogen, a considerable portion of it never finds its way into the balance sheets of the gas companies." In order to determine where the missing ammonia was secreted, Professor Foster made extended experiments with coal in use by the South Metropolitan Company of London. He found that it contained 1.7 per cent of nitrogen equivalent to 179 pounds sulphate of ammonia per ton, but that only .25 per cent. was evolved as ammonia in ordinary distillation—not less then .86 per cent. remaining in the coke—and .58 per cent being either in the tar products, or as free nitrogen in the gas. The coke contained 3½ times as much as was secured from the hydraulic main condensers and scrubbers, and, if recovered, would equal 3½ tons of sulphate additional, from a 100 tons of coal, worth $315, added to the one ton, $90, would make $405—or $4.05 per ton of coal carbonized. With this result obtained, the prophecy of Dr. Letheby would soon be realized—gas the residual.

It has been found that the whole of the ammonia remaining in the coke may be eliminated by subjecting it to the action of steam at a high temperature—say by passing a current of steam through the coke in the retorts at the latter period of the distillation of the coal, or injecting water among the coke, to be then decomposed, to produce hydrogen to form ammonia with the nitrogen in the coke.

It is now absolutely determined that high heats, especially such as are gained by the use of regenerative and recuperative furnaces, diminish largely the percentage of ammonia—cyanogen being formed instead of ammonia.

It will be of interest to know the income derived from ammonia by European gas companies. Referring to the columns of the London *Journal of Gas Lighting*, we find almost weekly the published reports of coal carbonized, cost of same per ton, selling price of gas, and amounts received for coke, tar and ammoniacal liquor, or sulphate of ammonia.

For several years I have diligently collected these figures, and now give you a few extracts and comparisons with similar receipts for ammoniacal liquor, or sulphate, in the United States.

Leeds, England, 75 cents per ton of coal; London Gas Company, England, 60 cents per ton; Commercial Company, London, 60 cents per ton; South Metropolitan Company, London, 62 cents per ton; Dewsbury Company, England, sulphate of ammonia paid for the coal; Birmingham Company, England, ammoniacal liquor, one year, $236,847; Bradford Company, England, ammoniacal liquor, one year, $55,144; Sunderland Company, England, residual nearly paid for coal; Peterbourgh Company, England, 60 cents per ton. Manchester Company, England, (1881) ammoniacal liquor, $163,387; South Metropolitan Company, England, (1880) ammoniacal liquor, $225,758; Crystal Palace Company, England, (1881) $25,120; Dublin Company, Ireland, (1881) $25,640; Chartered Company, London, (1881) $792,175.

Dr. C. W. Siemens, in his inaugural address as President of the British Association, in August last, stated that the number of tons of coal carbonized by gas companies in the United Kingdom equalled 9,000,000, costing $27,000,000; that it yielded 95,000 tons sulphate ammonia, selling for $9,735,000, equal, per ton of coal, to $1.08.

The United States carbonize, per annum, 2,000,000 tons, which should yield 21,400 tons sulphate, worth $2,163,334.

As a matter of fact, of the 825 gas companies in this country, 31 companies, carbonizing, per annum, 1,102,000 tons, receive, for ammoniacal liquor,

$98,700, or, per ton of coal, 9¼ cents; and, of this number, eight companies, carbonizing 208,000 tons, receive, per annum, $41,600, or, at the the rate of 20 cents per ton. Thus it is seen that 27 companies, carbonizing 815,000 tons, receive, per annum, but $57,100, or, per ton of coal, 7 cents. The lowest price is received by the Philadelphia Gas Trust, 4 cents per ton; the highest price by the Williamsburgh Gas Company, 27¼ cents per ton.

The main reason for this large difference in receipts is due to the fact that each of the eight companies referred to have in operation the most efficient apparatus for the removal of all the ammonia, by the use of a limited quantity of water, by which ammonical liquor, of from 15 to 30 ounce strength, is obtained.

The question doubtless will be asked, "Why cannot we obtain the same price for our ammonical liquor that is received by English companies?" To which the truthful reply can be made that it is worth as much; and, given 30 gallons per ton of coal, of 10 ounce liquor—unless the the sulphate maker will pay at least 40 cents per ton, then every such gas company should convert it into sulphate, and 60 cents per ton can positively be made at the present net cash prices of this article.

Why should you obtain every possible penny from your residuals? The question is most pertinently and significantly answered by the distinguished gas engineer, Mr. Charles Eastwood, President of the Manchester (England) District Institution of Gas Engineers, in his inaugural address, delivered February 24, when, referring to the sharp competition between gas and electricity, he stated, "The final battle will be fought and won on the question of 'Residual Products.'"

New Sources of Petroleum.

The *Journal of the Society of Arts* states that, although petroleum has long been known to exist in Bavaria, it is only quite recently that regular borings have been undertaken, which have proved that its quality is superior to that of Oelheim. Whereas, at Oelheim, a light oil, like that of America, is only found at a great depth, in Bavaria a light oil, of 0·811 specific gravity, which ignites easily and leaves but little residue, is found comparatively on the surface. This product is of a greenish-brown color, and is rich in volatile matters; at 180° C. (366° Fahr.) it gives out about 14 per cent. of a clear and very inflammable naphtha, of 0·731 specific gravity; and at 320° C. (608° Fahr.) it yields 39 per cent. of a raw yellow oil, of 0.786 specific gravity, which is not so inflammable, and may be used for illumination. At a still higher temperature, there are obtained, successively, 16 per cent. of a reddish-yellow lubricating oil, of 0·834 specific gravity; and then 25 per cent. of an oil containing a large proportion of paraffin, from which lubricating oil and solid paraffin may be extracted. This richness in naphtha and paraffin gives the Bavarian petroleum a value at least equal to that of Pennsylvania, while its distillation is effected with great facility.

A petroliferous stratum has also been discovered in the Limogne valley, near Puy-de-Dôme, in France; and borings undertaken by a new company give strong hopes for the future. At the same time, an oil-spring has also been discovered at Pechelbronn, in Alsatia, at a depth 138 meters (45 feet), and which at present yields 10.8 tons per 24 hours. In Austria, public attention is becoming more and more turned to the native sources of petroleum, while in the neighboring state of Roumania, new companies are being formed to work the oil-springs.

Creosoting Timber.

The American Society of Civil Engineers appointed a committee some four years ago with the purpose of determining the best and most available methods of treatment for extending the durability of different kinds of wood. This question bids fair to be of national moment at no distant time, in view of the rapid manner in which our great forests are melting away before the strokes of the lumberman's axe; and the same topic should prove of more than passing interest to the gas men of this country, for should the creosoting of timber come into general use, the tar well and its contents would be closely looked after.

This committee has been pursuing its labors with much assiduity. It has sent out some 2,000 circulars; corresponded with some 350 persons; examined 104 patents; gathered such reports, pamphlets, and publications as it could obtain; and generally collected all the information obtainable concerning experience in preserving timber in this country and in Europe. In an advance brochure, which has lately been published by the committee, we find the following:

"Although almost innumerable methods of preserving timber have been tried, there are but few which have been successful. Of these there are at least three which, when well done, can be relied upon to prolong the life of wood exposed to the elements. These are: Kyanizing, Burnettizing, and Creosoting.

"In Europe these methods have passed beyond the domain of experiment. They there produce large economical results. In this country the principal obstacle to wood preservation has been the cheapness of timber. It did not pay to inject it, because, to be effective, the work must be well done, and the cost of effecting this has hitherto added an undue proportion to the price of our cheap woods. It was cheaper to let them rot and to renew them.

"This condition of affairs is fast being removed by the rapid enhancement in the price of timber, and the proximate exhaustion of our more available forests; so that the time has probably arrived when it is not only economical, but necessary, in many parts of the country, to prepare wood to resist decay in exposed situations."

The same pamphlet, in referring to creosoting, says:

"CREOSOTING."

"This consists in injecting the timber with hot creosote oil under pressure. The mode of application and necessity for seasoning are much the same as for burnettizing.

"For timber in very wet situations, or exposed to marine worms, the best method to use is that of creosoting. It is the most effective, but also the most costly, of the various processes.

"When well done it costs from $12 to $20 per thousand ft. b. m., or about 50 to 60 cents a tie. It is the favorite method used in England, and is there materially cheaper than here, in consequence of the lesser price of the oil.

"The English ties exhibited have been 20 to 22 years in use, and show perfect preservation. Ties and timber creosoted in this country are also shown, but have not had so long an exposure. It is probable that they would be thrown out of service, by being cut into by the rail, long before they would decay.

"Creosote oil is the only effective preservative known against the teredo navalis. All other substances have failed. How much of the oil must be injected to prove sufficient, probably depends upon the exposure. The English engineers specify 10 or 12 pounds of oil per cubic foot. Some French engineers, and the American engineers who have had experience in the South, specify from 14 to 18 pounds to the cubic foot, to be quite safe against the teredo. Each additional pound adds about $1.20 per 1,000 feet, b. m., to the cost.

"Where it will pay to use this process depends upon a number of local circumstances and prices, which cannot be enumerated here. It is very good but costly.

"There are other substances, such as prolignite of iron and sulphate of copper, which have proved fairly effective in preserving timber, but European experience seems to favor most burnettizing and creosoting.

"The original patents on all the effective processes have lone since expired. There are several patented modifications and modes of application, some valuable and some otherwise, which are still in force. Whether it will pay to use them, each railroad will decide for itself. As a rule other methods than those which have been mentioned are either less effective or are untried experiments.

"It cannot be too strongly insisted upon that to be effective the work must be well done. The sap or moisture must be got out of the timber, and a sufficient amount of antiseptic be put in. If the solution exceeds a certain strength, the wood is rendered brittle and inelastic, so that both skill and honesty are required to accomplish success."

Mr. O. Chanute, of New York city, is chairman of the committee; the final report is expected to be made this year.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

EXIT "SPRINGER."—The Peoples Gas Light Company, of Chicago, Ills., (West Side), Mr. A. M. Billings, president, and Mr. Henry Pratt, engineer, will construct coal gas works, of the most improved character, at the new Division street station. This company has been experimenting for about two years with the "Springer Patent Water Gas" process; and the advocates of the Springer system never let an opportunity pass of making the statement that Mr. Billings was among the most important of their converts. Mr. Frederic Egner, late of the Norfolk (Va.) Gas Works, has charge of the Division street works.

MR. BURNS IS JUST ABOUT RIGHT.—Mr. Burns, during the discussion which ensued upon the reading of his paper, at the Cincinnati meeting of the Western Gas Association, on the "Lowe Water Gas Works at Pullman, Illinois," is credited with the following comparison:

"Mr. Burns—The water gas process is a young giant. It has jumped into public favor almost as rapidly as has the electric light." Judging from the latest facts developed in the progress of electric lighting in this country and in England, the great trouble with the public who dipped its fingers into electric lighting schemes here and there is how to get back some portion of the money with which it so hastily parted. "Though lost to sight, to memory dear."

PRICE OF GAS REDUCED IN DANVILLE, PA.—The Danville (Pa.) Gas Company has issued a circular to its consumers, notifying them that on and after July 1, the price of gas will be reduced from $3.00 to $2.50 per thousand. This is the second reduction made by this company since January, of this year. A certain Mr. Shaw, representing the Edison Electric Illuminating Company, has made his appearance at this place, and succeeded in obtaining a charter; but his efforts are likely to come to grief, as he has not yet been enabled to place the stock. This description of "security" is not in much favor just now. It seems to run too much in the direction of making permanent "sinking funds."

BRINGING OLD GAS MAINS INTO USE.—Before the Consumers', the Peoples' and the old Baltimore Gas Companies consolidated, the competition between them, when operating independently, led to the placing of duplicate mains in many localities. Since the consolidation the Consolidated Company has use for only one line of mains, and where demands are made for gas facilities in new districts the duplicate mains are taken up and relaid in the new places. Permission has to be obtained from the city each time a street is torn up.

BIDS FOR COKE, PHILADELPHIA (PA.) GAS TRUST.—The Committee on Works of the Philadelphia Gas Trust met on the afternoon of Thursday, June 21, Mr. W. Alcorn in the chair. Twenty proposals, for the purchase of the coke made at the Ninth and Fifteenth Ward works, for the year ending June 30, 1884, were opened. The highest bid, 7½ cents per bushel, was made by Joseph N. Ruch; and 5½ and 6 cents, for the Fifteenth and Ninth Ward works, respectively, were the lowest offers. The bids were ordered to be referred to a sub-committee and scheduled. At the rate of 7½ cents per bushel there will be an estimated gain to the Trust from this item, at the two stations mentioned, of $30,000 a year. The production is estimated at 300,000 bushels, and the present price received is 6½ cents.

MORRIS, TASKER & CO., TO FURNISH RETORTS TO THE PHILADELPHIA GAS TRUST.—The Gas Trust lately ordered, from Morris, Tasker & Co., 154 cast-iron retorts at 2⅞ cents per pound.

GAS RATES UNCHANGED.—Trustee W. H. Smith's resolution to reduce the price of gas to $1.80 per 1,000 feet was discussed at a meeting of the Finance Committee of the Philadelphia Gas Trust, held on a late date. Mr. Smith, in explanation of his motion, stated that the proposed reduction would cause a falling off in the yearly receipts of only $125,000. Mr. Lane, who wanted the question indefinitely postponed, contended that the reduction would amount to $180,000. Mr. Gill said the expenditures this year in making betterments were unusually large. He argued that it would be a dangerous experiment and might result in the suspension of improvements. Mr. Smith contended that the receipts of the past year fully warranted the expenditure of $800,000 for improvements and the reduction in the price of gas. On motion of President Gardner the matter was postponed.

REDUCTION IN PRICE OF GAS AT PETERSBURGH, VA.—The Petersburgh (Va.) Gas Light Company announces a reduction in price of gas (to date from July 1,) from $3 to $2.50 per thousand. The cost of the gas supplied to street lamps is $2.37½ per thousand.

ELECTRICITY VERSUS GAS IN DETROIT, MICH.—At the meeting of the Detroit (Mich.) Board of Aldermen, held June 19, a statistical debate took place over the amended resolution for lighting the city by gas and by electricity. Alderman Falvey opposed the adoption of the report, and Alderman Fales spoke in favor of it. The latter asserted that 27 times as much light could be had from electricity for the same money as from gas. He said that a leading stockholder in one of the gas companies had asserted yesterday that the aldermen would not concur in the recommendation of the upper house, and had offered to gamble upon it. Alderman Fales did not understand this. What assurance had anybody for making that statement? He hoped the board would not be bulldozed or influenced by the gas companies. Detroit had outgrown its swaddling clothes; it was no longer a village, and he hoped to see it discard "tallow dips, or gas if you please."

Alderman Falvey thought it was worse than moonshine, this talk about electricity being cheap as gas. It was claimed that one electric lamp would displace five gas lamps. Nonsense! The Brush company proposed to erect 50 electric lamps in a district now lighted by 101 gas lamps. This was only displacing two gas lamps by one electric light and would cost the city $7,000 a year more than gas. One gas lamp, consuming four cubic of gas an hour cost the city about $18.70 per year at $1.25 per thousand feet. One electric lamp at 50 cents per night, cost, $182.50 a year, and 50 lamps amounted to $9,125, or $7,236 more than gas would cost for the disputed district. Alderman Falvey said that it was also uncertain if the Brush company could be relied on to fulfill their contract.

The Brush company's communication to the city controller stating there would be no increase for lighting all night was read, and after further discussion the upper house amendment was referred to the gas committee, which practically seals its fate, the committee having already reported against electricity.

PRESCOTT (ARIZONA TERRITORY) TO HAVE ELECTRIC LIGHT.—The Brush-Swan Electric Light Company, of Prescott, has just been incorporated. Its directors and stockholders are prominent men of Prescott. The capital stock of the company is $50,000. This company was organized by Mr. T. F. Cronise, agent of the Rocky Mountain Electric Light Company, the headquarters of which are at Sal: Lake City, Utah.

MAXIM LIGHTS FOR LANCASTER, PA.—It is stated that the Maxim Electric Light Company are to erect 120 lights for purposes of street illumination in Lancaster, Pa. Sixty of the lamps are to be in position by the 10th of August, and the remaining sixty are to be ready by September 10. The Lancaster solons will not learn from the experience of other places; well, if they will not be taught, let them "pay the piper."

PRICE OF GAS REDUCED BY FULTON-MUNICIPAL (BROOKLYN, N. Y.) COMPANY.—The Fulton-Municipal Gas Light Company of Brooklyn, N. Y., on June 15th reduced the price of gas from $2 to $1.75 per thousand cubic feet. The secretary of the company states that great difficulty is being experienced in supplying gas engines for small powers, the demand for such being simply astonishing.

HOW THE ELECTRIC LIGHT APPEARS TO SOME PEOPLE IN ALBANY, N. Y.—Albany does not appear to be overjoyed with her electric lighting experiment, as witness the following from the Albany *Times*:

"Under the new charter of the city of Albany, the board of contract and apportionment may enter into a contract for lighting the streets of this city for a term of 999 years, or longer if they shall see fit. All other contracts are limited to two years, but this is entirely without restriction. Already gas has been entirely superseded in the streets, only two lamps being retained, on the theory that this will be regarded as fulfilling the contract of the city with the gas company, which does not expire till next fall, when very likely the theory will be tested by tedious and expensive litigation. The electric light shines from the river front to the intersection of Madison and Western avenues. In the winter the service is excellent; in the summer, owing to the height of the poles on which the lights are placed, much of the illumination is cut off by the foliage of the trees, and as a whole, the city is then practically little better lighted than it was by gas. In the vicinity of the pole there is too much light, but in the shadow the darkness is dense. The electric light is also expensive. It will cost the city $5, where gas cost $1. This is a great increase. Had the proposition been made to put up five gas lamps, where there was only one before, a perfect howl would have been heard; but had it been carried out, we should have certainly had a much more even and probably quite as satisfactory a light every way. But Albany has the electric light, and differing from almost every other, if not every other city in the United States, she has paid for the outfit. For once, this conservative old town has gone too fast. The electric light is an experiment. Other cities which have partially adopted it find that they can not afford any such extravagance. For instance, it being rumored that in Cleveland, Ohio, which, next to Albany, has been cited as a city in which the new light had made the most rapid advances, it was about to be abandoned, the editor of the *Times* made inquiry of the mayor of that city, who replied as follows:

CLEVELAND, May 31, 1883.

Dear Sir: Cleveland does not do much in way of electric lighting—and when present contracts expire, will probably discontinue, if for no other reason than the lack of funds; the system costing the city about five times more than gas. Very respectfully yours, JOHN H. FARLEY, Mayor.

"The other day we published extracts from the very sensible veto message of Mayor Manning of Buffalo, returning, without his approval, a resolution providing for the extension of the electric light through certain streets in that city, and based on the ground, among others, that they could be lighted with gas at 60 per cent. less.

"It will be said, of course, that 'Albany wants the best;' but she will have to pay accordingly. She is in pretty deep already, but is to be hoped that she will not go in over her head, as she surely will, if the electric light contract is relet for a long term of years. The excuse will be made that we have bought the 'plant,' and it is too late, nothing can be done, and it doesn't matter whether the next contract is for one or twenty. Not so. The elephant is a great eater, and it took a good deal of money to pay for him; but let us not tie our hands so we can not chop his head off, if his appetite become too ravenous. Despite our city charter, so shrewdly worded as to allow of this gigantic jobbery, the board of contract and apportionment are under no obligation to carry out the scheme. Nothing is to be gained by the city, and thousands of dollars may be lost to it by a long contract. It should be renewed yearly, at most. No one can tell what twelve months will bring forth in this inventive age. Experiments may yet demonstrate that the electric light can be produced at one-tenth the present cost; and then how rash

and ruinous would appear a contract under which the city pays yearly $200 a lamp!

What New London, Conn., Pays for Gas.—New London, Conn., will pay for lighting its streets with gas, during the fiscal year, the sum of $9,000.

A Short History of the Sheffield United Gas Light Company, of Sheffield, England.—It will be remembered that the annual general meeting of the Gas Institute was this year held at Sheffield, Eng. A short history of the Sheffield United Gas Light Company will prove of interest, and show the amazing advances which have been made in the status of the gas making industry on the other side of the water.

In the year 1818 the first company was formed, with a capital of $200,000. The first meeting of the shareholders was held in June, 1818, and works were constructed at a point in the town called Shude Hill. The center of the town was first lighted in the early part of 1819, the price charged for gas being $3 per thousand cubic feet; and up to 1832 eighteen miles of mains were laid. In the year 1834 a new company was formed to supply gas at a cheaper rate. The old company, on learning of this project, on January 1, 1834, reduced the price to $2. When the new company, which had a capital stock of $400,000, commenced operations in 1835, the usual spectacle of cutting rates was witnessed. On October 23, 1843, a meeting of the directors of the two companies was brought about, the object being the amalgamation of both concerns. The jointure was effected on July 4, 1844, and the Sheffield United Gas Light Company formed with a capital of $675,000, and borrowing powers of $225,000. In 1850 the Town Council, supported by the public, decided to start a Gas Consumers' Company, which was to supply gas at 75 cents per thousand cubic feet, against the $1.25 per thousand charged by the United Company. The corporation began to erect works at Neepsend in October, 1852, and from that time commenced a period of litigation between the two companies—trials, fresh trials, and appeals were constantly going on. Meanwhile there was continual warfare between the rival companies' men in the streets—one party laying new mains while the others were pulling out and breaking them (not only the pipes, but each other's heads and limbs).

In November, 1853, the Consumers' Company agreed to amalgamate with the old company, and the articles of amalgamation were ratified on May 5, 1855. The combined capital of the companies as united now reached the sum of $1,324,920, with borrowing powers of $400,000. Since that time the United Company has gone on increasing from year to year, as will be seen from the following rough statement:

In the year 1820 there were 48 street lamps, the make of gas was about 5,000,000, and the number of consumers was about 400. At the time of the amalgamation there were 1,200 street lamps, the make was 183,000,000, and the number of consumers 8,300. At the present time there are 5,000 street lamps, the make last year (1882) was 1,300 millions, and the number of consumers is 40,000.

The company has established a chemical works at Grimesthorpe, and has also erected a sulphuric acid works; and the results so far have fully justified the expenditure—the make of sulphate of ammonia being about 40 tons per week. The present total make of gas is 1,300 millions per annum. The heaviest single day's consumption during last winter was over 9,000,000, and the heaviest week's consumption over 51,000,000—being double what it was the previous year. The company has from 700 to 800 miles of mains laid in all sizes, varying from 2 inches to 30 inches, the leading sizes being from 18 to 30 inches. The company's powers extend over a district of 20¼ miles from east to west, by 12¾ miles from north to south, the portion already lighted extending over 11 miles north to south, by 7 miles east to west.

Taxing the Mains of Gas and Water Companies.—The assessors in the various towns of Richmond county, N. Y., have decided this year to tax the pipes of all water and gas companies. What will they levy on next? No wonder Staten Island preserves its rural aspect.

American Association for the Advancement of Science.—The Thirty-second Meeting of the American Association for the Advancement of Science will be held at Minneapolis, Minn., commencing August 15th and terminating August 21.

The Market for Gas Securities.

The market for New York city gas shares since June 16th has developed some strength, but the trading has been very light, and it is fair to presume that the dull summer season now begins. The operations of the Equitable company do not seem to have created the slightest ripple of uneasiness in the minds of the holders of city gas securities, and the general impression is that prices are bound to see higher figures. Harlem gas shows an improvement—we quote it at 101 to 103; Manhattan gas is also stronger, 232½ being bid—this is an advance of 4½ points from the last lowest bid quotation; New York gas shows a slight decline, 120 being bid, with stock offered at 123; Municipal gas sells, ex-dividend of 5 per cent., made payable June 27, at 180 to 185; Mutual gas is strong and higher—latest figures 117 to 119; Metropolitan gas remains at previous prices, 187 to 189. The statement that New York city gas stocks are strong, with small offerings, will about cover the situation as at present existing.

Brooklyn, N. Y., gas shares are sluggish and inactive, with a tendency to weakness. We quote Brooklyn gas at 105 to 108, which will be noted as a slight decline. The fact that the Fulton Municipal Company made a reduction of 25 cents per thousand in the price charged for gas, on June 15, and the general feeling of uncertainty now prevalent in gas matters in the city at the east end of the "big bridge," as to what is likely to be done in the matter of "cutting rates," or a probable gas war, accounts very easily for the present flabby state of the market for Brooklyn gas shares. The Williamsburgh Company's new board of direction have not yet shown their hands—in fact officers for the ensuing year have not yet been chosen.

In out-of-town shares we note a decided improvement in Laclede gas, St. Louis, Mo., we quote it at 100 bid, offered at 105; Hartford, Conn., gas is also stronger, 116 to 120; San Francisco, Cal., gas holds its last figure fairly well, 58¼ to 58¾; Central gas, of same place, is stronger, 45 being bid; Consolidated gas, Baltimore, Md., shows some improvement, 42⅛ to 42⅜; bonds of same company, 107½. Washington, D. C., gas keeps mounting the ladder. The outlook for out-of-town shares is very promising in all directions, and there is every probability that all classes of gas securities will record higher figures.

Correspondence

[The Journal is not responsible for the opinions expressed by correspondents.]

Some Results in Coal and Water (Lowe) Gas Making.

Peoples Gas Light and Coke Co.,
39–48 Halsted street, Chicago, Ills., June 22, 1883.

To the Editor American Gas Light Journal:

Reading the interesting discussion of a paper on water gas, published in your Journal of the 16th inst., the subscriber thought the following facts might be appreciated by your readers, as they bear directly on questions asked, and apparently not very satisfactorily answered. The writer had, for a number of years, charge of a works where coal and water gas was made; and, the local conditions being the same, these results may throw some light on the vexed question. The results are given in such a form as would seem most applicable to all works, wherever they may be. The question—what the gas costs—ought never to be asked an engineer or superintendent, except by those having a legal right to know; and ought certainly never to be answered with the exception noted. No good can be gained by the attainment of such knowledge; but the comparison of working results is a very different thing—and what the gas costs has nothing to do with these. The place was Norfolk, Va.; the coal mostly West Virginia caking coal; the retorts 12″ × 20″ × 8′7″, set in benches of fives, with the old style of furnace. The average results, for the year 1880, were: One thousand cubic feet of gas, of 16.7 candle power required 193.42 pounds of coal. Counting all the labor required in gas making, even burning the shells to make the lime—in fact everything except superintendence—13,500 cubic feet of gas was made per man employed. Please bear in mind that not retort house labor, but *all*, even to cleaning the works, is included; one bushel of slacked shell lime purified 4,649 cubic feet of gas. Now for the year 1881: One thousand cubic feet of gas, of 16.9 candle power, required 192.67 pounds of coal, but a trifle less labor, oxide of iron being used instead of lime for purification. The average results with the oxide were: One bushel purified 6,742 cubic feet of gas before changing and reviving. Our results continued about the same, when, in the middle of 1882, we tried the Lowe process. We ran with this process for two months, and then resumed coal gas making for the winter. In January, this year, we resumed gas making with the Lowe process, and continued until this date, the gas and results giving general satisfaction. The results of seven months running average as follows: One thousand cubic feet of gas, of 19.5 candle power, required 47.18 pounds of coal all told; 4.42 gallons of naphtha of 70°; and to each and every man employed about the works, with the exception previously noted, could be credited 35,000 cubic feet of gas; more could have been made. The photometer used was the same in all cases, viz., a Bunsen bar, with an Argand burner. For the convenience of the reader, it may be stated that the coal gas results were 5.17 cubic feet, and 5.19 cubic feet per pound of coal in the years 1880 and 1881, respectively. The company *did not* abandon its coal works on account of the results obtained with the Lowe works; but this past spring, rebuilt and improved its benches setting eights instead of fives; still further improved its water gas plant, by judicious additions to increase its efficiency, and was about to announce a very material reduction in the price of gas, which was only then $1.70 per thousand, when the writer's active connection with that company ceased. Hoping these facts may be of interest, I remain yours, very truly, Frederic Egner.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks (with W. B. Scott & co.,)

34 Pine Street, New York City.

July 2, 1883.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Central	$466,000	50	85	90
Harlem	1,800,000	50	101	103
" Bonds	170,000		—	—
Manhattan	4,000,000	50	232	235
Metropolitan	2,500,000	100	187	189
" Bonds	658,000	—	105	110
Mutual	3,500,000	100	117	119
" Bonds	1,500,000	1000	103	105
Municipal	3,000,000	100	183	185x
" Bonds	750,000		102	104
New York	4,000,000	100	120	123
Northern	125,000	50	—	95
" Scrip	108,000			
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	105	108
Citizens	1,200,000	20	75	80
" S. F. Bonds	320,000	1000	105	107
Fulton Municipal	1,500,000	100	69	71
Peoples	1,000,000	10	45	50
" Bonds	290,000	—	104	107
" "	250,000	—	88	90
Metropolitan	1,000,000	100	80	85
Nassau	1,000,000	25	59	—
" Ctfs	700,000	1000	90	93
Williamsburgh	1,000,000	50	70	75
" Bonds	1,000,000	—	100	101
Richmond Co., S. I.	300,000	50	70	75
" Bonds	40,000	—	—	—
Out of Town Gas Companies.				
Buffalo Mutual, N. Y.	750,000	100	72	75
" Bonds	200,000	1000	95	100
Citizens, Newark	918,000	50	80	85
" " Bonds	124,000	—	105	10
Chicago Gas Co., Ills.			150	155
Cincinnati G. & C. Co.			178	180
Consolidated, Balt.			42⅛	42⅜
" Bonds			105	106
Central, S. F., Cal.			45	—
Capital, Sacramento, Cal			—	56½
Hartford, Conn	750,000	25	116	120
Jersey City	750,000	20	155	165
Laclede, St. Louis, Mo.	1,600,000	100	100	105
Montreal, Canada	2,000,000	100	186	187
New Haven, Conn		25	144	—
Oakland, Cal			—	29¾
Peoples, Jersey City			72	75
" " Bonds			—	—
Paterson, N. J		25	96	99
Rochester, N. Y		50	70	80
Washington, D. C	2,000,000	20	175	—
Wilmington, Del		50	174	—
Yonkers		50	33	35
St. Louis, Missouri	600,000	50	250	254
San Francisco Gas Co. San Francisco, Cal.			58½	58¾

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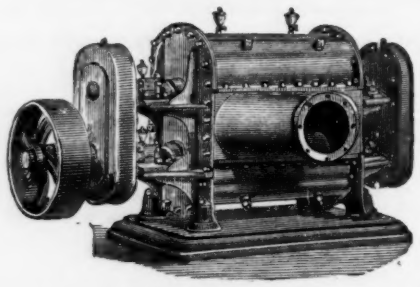

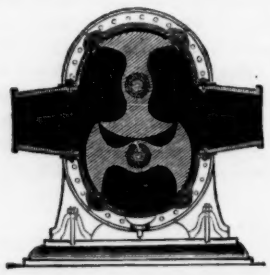

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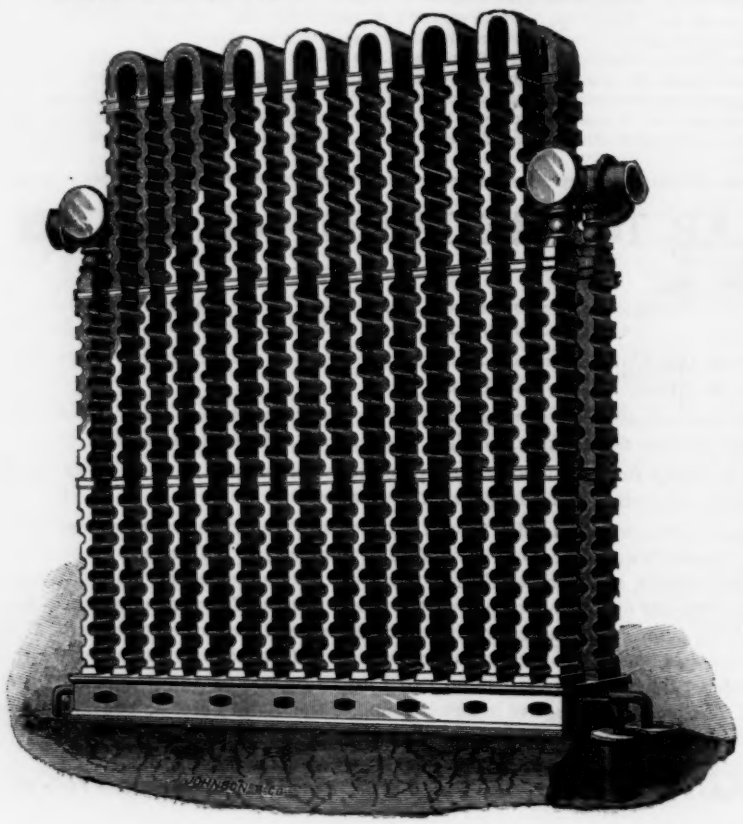
TRUSTEES AND AGENTS FOR THE

SINUOUS FRICTION CONDENSER.



We desire to draw the attention of the gas community to the merits of the SINUOUS FRICTION CONDENSER. Companies intending to introduce new condensers into their works will do well to confer with us and examine plans and estimates before contracting for any other pattern. The FRICTION CONDENSER is now in use at the gas works located in the following places:

Portland, Me.	Brookline, Mass.	Pawtucket, R. I.	Frederickton, N. B.
Newport, R. I.	Chelsea, Mass.	Jamaica Plain, Mass.	St. John, N. B.
Gloucester, Mass.	Woburn, Mass.	Attleboro, Mass.	Paterson, N. J.
Newton & Watertown, Mass.	Peoria, Ill.	Calais, Me.	Dover, N. H.
	Clinton, Mass.	Fall River, Mass.	Waltham, Mass.
	Nassau Works, Brooklyn, N. Y.		

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